Appl. No.: 10/707,338
Amdt. Dated: 3/5/2006
Reply to Office action of: 01/04/2006

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claim 1 (currently amended) Process for manufacturing printed circuit boards from an extruded polymer~~, of the type~~ comprising the steps:

preparing at least one plate (10) of electro-conductive material, carrying out a first selective engraving on a first side (10a) thereof so as to form several embossments (11) corresponding to future tracks and several depressions (12) corresponding to future inter-track areas;

applying a dielectric substrate material, in a pasty or semi-pasty state, on said first side (10a) of the plate (10) of electro-conductive material, covering said embossments (11) and filling said depressions (12); and

once said dielectric substrate material has hardened, carrying out a second selective engraving on a second side (10b), opposite the first one, of said at least one plate (10) of electro-conductive material so as to eliminate ~~the~~ said dielectric substrate material thereof corresponding to said future inter-track areas,

giving several finished tracks (13) isolated from each other ~~as a result, separated~~ by inter-track areas (14) and partially enclosed on one side by said dielectric substrate material, characterized in that said step of applying a substrate material comprises:

obtaining by extrusion at least one first heated sheet (20a) of said dielectric substrate material from a thermal-plastic material;

depositing said first heated sheet (20a) on said first side (10a) of the plate (10) of electro-conductive material; and

subjecting the first heated sheet (20a) and plate (10) assembly to a predetermined pressure so that the dielectric substrate material completely fills said depressions (12) and encloses said embossments (11).

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Claim 2 (currently amended) Process according to claim 1, characterized in that said step for depositing the first heated sheet (20a) on the first side (10a) of the plate (10) of electro-conductive material includes placing the plate (10) between several plates (81, 82) of a press (80) located immediately next to the outlet of an extrusion machine (60) of said thermal-plastic dielectric substrate material and then depositing said first heated sheet (20a) on the plate (10) just as it comes out of said extrusion machine (60).

Claim 3 (currently amended) Process according to claim 2, characterized in that before said step of subjecting the plate (10) and first heated sheet (20a) assembly to pressure, a successive deposit of additional extruded sheets (20b,...20n) of said dielectric substrate material originating from the extrusion machine (60) on the assembly is included, the assembly resulting from depositing each extruded sheet having been rotated a predetermined angle before depositing a new extruded sheet.

Claim 4 (currently amended) Process according to claim 2 ~~or 3~~, characterized in that it also comprises:

preparing a second plate (30) of electro-conductive material, carrying out a first selective engraving on a first side (30a) thereof so as to form several embossments (31) corresponding to future tracks and several depressions (32) corresponding to future inter-track areas;

before the step of subjecting the plate (10) and first heated sheet (20a) assembly, and additional sheets (20b,... 20n) where applicable, to pressure,

applying said second plate (30) on the last of said sheets (20a, 20b,... 20n) deposited on the assembly, with said first side (30a) in contact with it; and

after the step of subjecting the assembly to pressure and once said dielectric substrate material has hardened,

carrying out an additional second selective engraving on a second side (30b), opposite the first, of said second plate (30) of electro-conductive material so as to eliminate ~~the~~ said dielectric substrate material thereof corresponding to said future inter-track areas,

such that several tracks (13) remain that are isolated from each other, separated by

inter-track areas (14) and partially enclosed on two opposite sides by said dielectric substrate material (20a, 20b,... 20n).

Claim 5 (currently amended) Process according to ~~any one of the previous~~ claims 1, 2, 3, 4, or 18, characterized in that it comprises subjecting said previously engraved first side(s) (10a, 30a) of the plate(s) (10, 30) of electro-conductive material to a surface treatment for improving the junction capacitance; and applying a layer of adhesive material (50) on said engraved and superficially treated first side(s) (10a, 30a) of the plate(s) (10, 30) of electro-conductive material before applying the dielectric substrate material (20a, 20b,... 20n).

Claim 6 (original) Process according to claim 5, characterized in that said surface treatment for improving the junction capacitance comprises a black oxide (40) operation consisting of putting said first side(s) (10a, 30a) of the plate(s) (10, 30) of electro-conductive material into contact with an aqueous solution of sodium hydroxide and sodium hypochlorite, producing a micro-etching so as to provide a determined surface roughness.

Claim 7 (original) Process according to claim 6, characterized in that said black oxide operation comprises:

applying a protective mask to said second side(s) (10b, 30b) and/or parts of the plate(s) (10, 30) of electro-conductive material which do not need to be treated;

subjecting the plate(s) (10, 30) of electro-conductive material to said treatment by immersion or spraying; and

subsequently removing said protective mask so as to leave a layer of black oxide (40) only in those areas intended to receive the dielectric material (20a, 20b,... 20n).

Claim 8 (original) Process according to claim 6, characterized in that said black oxide operation comprises:

completely subjecting the plate(s) (10, 30) of electro-conductive material to said treatment by immersion or spraying; and

subsequently removing the black oxidation from said second side(s) (10b, 30b)

and/or parts that do not need said treatment so as to leave a layer of black oxide (40) only in those areas intended to receive the dielectric material (20a, 20b,... 20n).

Claim 9 (original) Process according to claim 5, characterized in that said application of a layer of adhesive material (50) is carried out by spraying.

Claim 10 (original) Process according to claim 5, characterized in that said adhesivematerial(50)comprises an organic solvent base and a solids content formed by synthetic elastomers.

Claim 11 (original) Process according to claim 10, characterized in that said layer of adhesive material (50) is subjected to pre-drying, without reaching curing, so as to provoke evaporation of said solvents before the jet molding step.

Claim 12 (original) Process according to claim 11, characterized in that said pre-drying is carried out openly at room temperature.

Claim 13 (original) Process according to claim 11, characterized in that said pre-drying is carried out in an oven at a temperature of 25 to 100°C.

Claim 14 (original) Process according to claim 5, characterized in that during said step of subjecting the assembly to pressure, the adhesive material (50) is activated, by virtue of said pressure and of the temperature of the dielectric material (20a, 20b,... 20n), an adherence thus being carried out between said dielectric material (20a, 20b,... 20n) and the plate(s) (10, 30) of electro-conductive material.

Claim 15 (currently amended) Process according to claims 1, ~~or~~ 4, or 18 characterized in that the engraving of the first engraving step of the plate (10, 30) so as to carry out said depressions (12) corresponding to future inter-track areas (14) reaches a depth of 85 to 95% of the thickness of the plate (10, 30) of electro-conductive material, such that said finished tracks (13), partially enclosed in the dielectric material (20a, 20b,... 20n), have an emerging part which is from 5 to 15% of its thickness.

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Claim 16 (currently amended) Process according to claim<u>s</u> 1, ~~or~~ 4, <u>or 18</u>, characterized in that said plate(s) (10, 30) of electro-conductive material is/are copper plate(s).

Claim 17 (original) Process according to claim 16, characterized in that said copper plate(s) (10, 30) has/have an approximate thickness of 400 μm, suitable for power applications.

Claim 18 (new) Process according to claim 3, characterized in that it also comprises:

preparing a second plate (30) of electro-conductive material, carrying out a first selective engraving on a first side (30a) thereof so as to form several embossments (31) corresponding to future tracks and several depressions (32) corresponding to future inter-track areas;

before the step of subjecting the plate (10) and first heated sheet (20a) assembly, and additional sheets (20b,... 20n) where applicable, to pressure,

applying said second plate (30) on the last of said sheets (20a, 20b,... 20n) deposited on the assembly, with said first side (30a) in contact with it; and

after the step of subjecting the assembly to pressure and once said dielectric substrate material has hardened,

carrying out an additional second selective engraving on a second side (30b), opposite the first, of said second plate (30) of electro-conductive material so as to eliminate said dielectric substrate material thereof corresponding to said future inter-track areas,

such that several tracks (13) remain that are isolated from each other, separated by inter-track areas (14) and partially enclosed on two opposite sides by said dielectric substrate material (20a, 20b,... 20n).